SECTION 07 52 16.13 R1
STYRENE-BUTADIENE-STYRENE MODIFIED BITUMINOUS MEMBRANE ROOFING, COLD-APPLIED

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section specifies **3-ply** modified bituminous sheet roofing and base flashing installed using cold-applied adhesive on new construction with solar reflective granular coating.

B. Repairs and alteration work, including temporary roofs.

C. Liquid-applied flashing.

1.2 RELATED WORK:

A. Roof Insulation under Membrane: Section 07 22 00, ROOF AND DECK INSULATION.

B. Fluid applied roof membrane: Section 07 56 00, FLUID APPLIED ROOFING.

C. Sheet metal components and wind uplift requirements for roof-edge design: Section 07 60 00, FLASHING AND SHEET METAL.

1.3 APPLICABLE PUBLICATIONS:

A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only. Editions of applicable publications current on date of issue of bidding documents apply unless otherwise indicated.

B. American National Standards Institute/Single-Ply Roofing Institute (ANSI/SPRI):
ANSI/SPRI ES-1-03..... Wind Design Standards for Edge Systems Used with Low Slope Roofing Systems

C. American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI):
ASCE/SEI-7-10..... Minimum Design Loads for Buildings and Other Structures

D. Asphalt Roofing Manufacturers Association/National Roofing Contractors Association (ARMA/NRCA): Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing.

E. ASTM International (ASTM):
C1370-00(R2005)..... Standard Test Method for Determining the Chemical Resistance of Aggregates for Use in Chemical-Resistant

Sulfur Polymer Cement Concrete and Other Chemical-Resistant Polymer Concretes

C1371-04 ..... Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers

C1549-04 ..... Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer

D146-04 ..... Standard Test Methods for Sampling and Testing Bitumen-Saturated Felts and Woven Fabrics for Roofing and Waterproofing

D1644-01(R2006) ..... Standard Test Methods for Nonvolatile Content of Varnishes

D2523-00(R2006) ..... Standard Practice for Testing Load-Strain Properties of Roofing Membranes

D2823-05 ..... Standard Specification for Asphalt Roof Coatings, Asbestos Containing

D3960-05 ..... Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings

D4073-06 ..... Standard Test Method for Tensile-Tear Strength of Bituminuous Roofing Membranes

D4263-83(2005) ..... Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method

D4586-07 ..... Asphalt Roof Cement, Asbestos Free

D4601-04 ..... Standard Specification for Asphalt-Coated Glass Fiber Base Sheet Used in Roofing

D4897-01 ..... Asphalt Coated Glass Fiber Venting Base Sheet Used in Roofing

D5147-07 ..... Standard Test Methods for Sampling and Testing Modified Bituminous Sheet Material

D5201-05(R2010) ..... Standard Practice for Calculating Formulation Physical Constants of Paints and Coatings

D6162-00(R2008) ..... Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements

D6163-00(2008) ..... Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements

D6164-05 ..... Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements

D6511-06 ..... Standard Test Methods for Solvent Bearing Bituminous Compounds

E108-10..... Standard Test Methods for Fire Tests of Roof Coverings

E408-71(R2008)..... Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques

E1918-06..... Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field

E1980-01..... Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field

WK 29032-10..... Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer

F. American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)

ASHRAE 90.1-2007..... Energy Standard for Buildings Except Low-Rise Residential Buildings, Appendix f.

G. FM Approvals: RoofNav Approved Roofing Assemblies and Products.

4450 ..... Approved Standard for Class 1 Insulated Steel Deck Roofs

4470 ..... Approved Standard for Class 1 Roof Coverings

1-28..... Loss Prevention Data Sheet: Design Wind Loads.

1-49..... Loss Prevention Data Sheet: Perimeter Flashing

H. National Roofing Contractors Association: Roofing and Waterproofing Manual

I. U.S. Environmental Protection Agency (EPA):

EPA 600/R13/116..... Method for the Determination of Asbestos in Bulk Building Materials

J. U.S. Department of Agriculture (USDA): USDA BioPreferred Catalog, www.biopreferred.gov

K. U.S. Department of Energy (DoE): Roof Products Qualified Product List, www.energystar.gov

1.4 PERFORMANCE REQUIREMENTS

A. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.

B. Roofing Membrane System Load-Strain Properties: Provide a roofing membrane identical to component systems that have been successfully tested by a qualified independent testing and inspecting agency to meet the following minimum load-strain properties at membrane failure when tested according to ASTM D2523:

1. Tensile strain at failure, at 0 deg F (-18 deg C):600 lbf (2.67 kN) cross machine direction, minimum; 4.0 to 5.5 percent elongation at break.

1.5 QUALITY CONTROL:

A. Installer Qualifications:

1. Licensed or approved in writing by manufacturer to perform work under warranty requirements of this Section.
2. Employ full-time supervisors knowledgeable and experienced in roofing of similar types and scopes, and able to communicate with owner and workers.

B. Inspector Qualifications: Inspection of work by third-party technical inspector or technical representative of manufacturer experienced in the installation and maintenance of the specified roofing system, qualified to perform roofing observation and inspection specified

in Field Quality Control Article, to determine Installer's compliance with the requirements of this Project, and approved by the manufacturer to issue warranty certification.

The Roofing Inspector shall be one of the following:

1. An authorized full-time technical employee of the manufacturer, not engaged in the sale of products.
2. An independent party certified as a Registered Roof Observer by the Roof Consultants Institute (RCI), retained by the Contractor or the Manufacturer and approved by the Manufacturer.

C. Product/Material Qualifications:

1. Obtain products from single manufacturer or from sources recommended by manufacturer for use with roofing system and incorporated in manufacturer's warranty.
2. Provide manufacturer's certification that field applied bituminous coatings and mastics, and field applied roof coatings comply with limits for Volatile Organic Compounds (VOC) per the National Volatile Organic Compound Emission Standards for Architectural Coatings pursuant to Section 183(e) of the Clean Air Act with limits as follows:
   a. Bituminous Coatings and Mastics: 500 g/l (4.2 lb/gal.).
   b. Roof Coatings: 250 g/l (2.1 lb/gal.).
3. Bio-Based Materials: Where applicable, provide products designated by USDA and meeting or exceeding USDA recommendations for bio-based content, and products meeting Rapidly Renewable Materials and certified sustainable wood content definitions; refer to www.biopreferred.gov.

D. Roofing system design standard requirements:

1. Recommendations of the NRCA "Roofing and Waterproofing Manual" applicable to modified bituminous sheet roofing for storage, handling and application.
2. Recommendations of FM Approvals 1-49 Loss Prevention Data Sheet for Perimeter Flashings.
3. Recommendations of ANSI/SPRI ES-1 for roof edge design.

4. FM Approvals Listing: Provide roofing membrane, base flashing, and component materials that comply with requirements in FM Approvals 4450 and FM Approvals 4470 as part of a roofing system and that are listed in FM Approvals "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals markings.
   a. Fire/Windstorm Classification: Class 1A-90.
   b. Hail Resistance: MH.
5. High Wind Zone Design Requirement: Contractor Option: In lieu of FM Approval Listing windstorm classification, provide roofing membrane, base flashing, and component materials that comply with Miami-Dade County requirements.

E. Pre-Roofing Meeting:
1. Upon completion of roof deck installation and prior to any roofing application, hold a pre-roofing meeting arranged by the Contractor and attended by the Roofing Inspector, Material Manufacturers Technical Representative, Roofing Applicator, Contractor, and COTR.
2. Discuss specific expectations and responsibilities, construction procedures, specification requirements, application, environmental conditions, job and surface readiness, material storage, and protection.
3. Inspect roof deck at this time to:
   a. Verify that work of other trades which penetrates roof deck is completed.
   b. Determine adequacy of deck anchorage, presence of foreign material, moisture and unlevel surfaces, or other conditions that would prevent application of roofing system from commencing or cause a roof failure.
   c. Examine samples and installation instructions of manufacturer.

1.6 SUBMITTALS:

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, SAMPLES.

B. Product Data:
1. Asphalt and adhesive materials.

2. Modified bituminous sheet roofing and flashing membrane.
3. Roofing adhesive.
4. Roof walkway.
5. Fastening requirements.
6. Application instructions.

C. Samples:
1. Nails and fasteners, each type.

D. Shop Drawings: Include plans, sections, details, and attachments.
1. Base flashings and terminations.
2. Nailers and cants.

E. Certificates:
1. Indicating materials and method of application of roofing system meets requirements of FM Approvals "RoofNav" for specified fire/windstorm classification.
2. Indicating compliance with load/strain properties requirement.
3. Indicating compliance with energy performance requirement.

F. Warranty: As specified.

G. Documentation of supervisors' and inspectors' qualifications.

H. Field reports of roofing inspector.

I. Temporary protection plan. Include list of proposed temporary materials.

J. Contract Close-out Submittals:
1. Maintenance Manuals.
2. Warranty signed by installer and manufacturer.

1.7 DELIVERY, STORAGE AND MARKING:

A. Comply with the recommendations of the NRCA "Roofing and Waterproofing Manual" applicable to built-up roofing for storage, handling and installation.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

B. Environmental Controls: Refer to Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.

C. Protection of interior spaces: Refer to Section 01 00 00, GENERAL REQUIREMENTS.

1.9 WARRANTY:

A. Roofing work subject to the terms of the Article "Warranty of Construction", FAR clause 52.246-21, except extend warranty period to 20 years from acceptance of facility by the Government.

PART 2 - PRODUCTS

2.1 ADHESIVE AND ASPHALT MATERIALS:

A. General: Adhesive and sealant materials recommended by roofing system manufacturer for intended use, identical to materials utilized in approved listed roofing system, and compatible with roofing membrane.

1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
   a. Multipurpose Construction Adhesives: 70 g/L.
   b. Contact Adhesives: 80 g/L.
   c. Other Adhesives: 250 g/L.
   d. Nonmembrane Roof Sealants: 300 g/L.
   e. Sealant Primers for Nonporous Substrates: 250 g/L.
   f. Sealant Primers for Porous Substrates: 775 g/L.

B. Water-Based Asphalt Primer: Water-based, polymer modified, asphalt primer with the following physical properties:

1. Asbestos Content, EPA 600/R13/116: None.
2. Non-Volatile Content, minimum, ASTM D2823: 30 percent.
3. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 65 g/L.

C. Cold-Applied Adhesive for sheet membrane: One-part, asbestos-free, low-volatile, cold-applied adhesive specially formulated for compatibility and use with specified roofing membranes and flashings, with the following physical properties:
   1. Asbestos Content, EPA 600 R13/116: None.
   2. Volatile Organic Compounds (VOC), maximum, ASTM D6511: <250 g/L.
   3. Nonvolatile Content, minimum, ASTM D6511: 75 percent.
   4. Uniformity and Consistency, ASTM D6511: Pass.

D. Cold-Applied Adhesive for membrane flashing: One-part, cold-applied adhesive specially formulated for compatibility and use with specified roofing membranes and flashings, with the following physical properties:
   1. Asbestos Content, EPA 600 R13/116: None.
   2. Volatile Organic Compounds (VOC), maximum, ASTM D6511: <250 g/L.
   3. Nonvolatile Content, minimum, ASTM D6511: 75 percent.
   4. Uniformity and Consistency, ASTM D6511: Pass.

E. Roof Cement: ASTM D4586, Type II.

2.2 MEMBRANE AND SHEET MATERIALS:

A. Membrane Materials, General: Provide combination of base, ply, and cap sheet materials that have been tested in combination and comply with load/strain properties performance requirement in Part 1 of this Section.

B. Base Sheet: ASTM D4601, Type II, non-perforated, asphalt-impregnated and coated glass-fiber sheet dusted with fine mineral surfacing on both sides, with the following properties:
   1. Breaking Strength, minimum, ASTM D146: cross machine direction, 12.2 kN/m (70 lbf/in).
   2. Pliability, 12.7 mm (1/2 inch) radius bend, ASTM D146: No failures.

C. Membrane Ply Sheet: ASTM D6162, Grade S, Type II , SBS modified asphalt sheet; smooth surfaced; suitable for application method specified, with the following minimum properties:

1. Tensile Strength at 23 deg. C (73 deg. F), minimum, cross machine direction, ASTM D5147: 21 kN/m (120 lbf/in).
2. Tear Strength at 23 deg. C (73 deg. F), minimum, cross machine direction, ASTM D5147: 890 N (200 lbf).
3. Elongation at 23 deg. C (73 deg. F), minimum, cross machine direction, at 5 percent maximum load ASTM D5147: 40 percent.

D. Membrane Cap Sheet: ASTM D6162, Grade G, Type III, composite polyester and glass-fiber-reinforced, SBS modified asphalt sheet; granular surfaced with a factory applied, white, reflective, acrylic coating; CRRC listed and California Title 24 Energy Code compliant; and as follows:

1. Exterior Fire-Test Exposure, ASTM E108: Class A.
2. Tensile Strength at 23 deg. C (73 deg. F), minimum, cross machine direction, ASTM D5147: 84 kN/m (480 lbf/in).
3. Tear Strength at 23 deg. C (73 deg. F), minimum, cross machine direction, ASTM D5147: 330 N (750 lbf).
4. Elongation at 23 deg. C (73 deg. F), minimum, cross machine direction, ASTM D5147: 6 percent.
5. Low Temperature Flex, maximum, ASTM D5147, -26 deg. C (-15 deg. F).

E. Base Flashing Backer Sheet: ASTM D4601, Type II, asphalt-impregnated and coated, glass-fiber sheet, dusted with fine mineral surfacing on both sides.

F. Base Flashing Sheet: ASTM D6164, Grade G, Type II, polyester-reinforced, SBS-modified asphalt sheet; granular surfaced; Granule Color: White.

2.3 FASTENERS:

A. Roofing Fasteners: Factory-coated steel fasteners and metal where applicable, meeting requirements of FM Approvals 4470, tested by fastener manufacturer for required pullout strength, and recommended by roofing manufacturer for application at metal deck.

B. Accessory Fasteners: Corrosion-resistant fasteners compatible with adjacent materials and recommended for application by manufacturer of component to be fastened.

2.4 COATINGS

A. Acrylic-latex elastomeric coating equal to Elastek #120, color=white.

1. **Calculated 67% solids by weight, 54% solids by volume.**
2. **Titanium 13% by volume.**
3. **VOC <50g/l; ph is 9.**
4. **Elongation exceeds 260% @ 75 ° F.**
5. **Viscosity is approximately 120-125 KU.**
6. **Water resistance in perms 2 (ASTM D 1653).**
7. **Swelling (7 day) 13%.**
8. **Tensile strength 340 lb/sq. inch.**
9. **Fungi and algae resistant.**
10. **Packaged weight 11.6 lb. per gallon.**
11. **Reflectivity 92% (white draw down).**
12. **CRRC reflectivity 86.5%.**
13. **CRRC emittance 0.87%.**
14. **Coordinate installation with SBS manufacturer recommendations.**

2.5 ROOF WALKWAY:

A. Prefabricated asphalt plank consisting of a homogeneous core of asphalt, plasticizers and inert fillers, bonded by heat and pressure between two saturated and coated sheets of felt:

1. Top side of plank surfaced with ceramic granules. Granule Color: White. Provide coating.
2. Size: Minimum 13 mm (1/2-inch) thick, manufacturer's standard size, but not less than 300 mm (12 inches) in least dimension and 600 mm (24 inches) in length.

2.6 LIQUID-APPLIED FLASHING:

A. PermaFlashA liquid and fabric reinforced flashing system created with a stitchboard polyester scrim and a two-compartment, moisture cured, elastomeric, liquid applied flashing material, consisting of an asphalt extended urethane base material and an activator.

B. Product:

1. PermaFlash System.

C. Typical Physical Properties:

1. ASTM D 412, Tensile Strength: 600 psi (4.13 MPa).
2. ASTM D 412, Elongation: >300%.
3. ASTM E 96, Method E [100° F (38° C), 100 mil (2.5 mm) sheet], Permeability to Water Vapor: 0.03 perms.
4. Working Time @ 75° F (25° C): 30 min.
5. Rainproof After @ 75° F (25° C): 4 hours.
6. ASTM D 2240, Hardness @ 77° F (25° C): 65 Shore A.
7. Crack Bridging After Heat Aging: 1/8: (3 mm).
8. ASTM D 36, Softening Point, Ring and Ball: 275° F (135° C).
9. ASTM C 836, Elastomeric Waterproofing: Exceeds all criteria.
10. ASTM D 4060, Abrasion Resistance, (1,000 gr./1,000 rev., CS-17 wheel): 1.2 mm loss.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine substrates and conditions with roofing Installer and roofing inspector to verify compliance with project requirements and suitability to accept subsequent roofing work. Correct unsatisfactory conditions before proceeding with roofing work.

B. Do not apply roofing if roof surface will be used for subsequent work platform, storage of materials, or staging or scaffolding will be erected thereon unless system is protected.

3.2 PREPARATION

A. Complete roof deck construction prior to commencing roofing work:

1. Install curbs, blocking, edge strips, nailers, cants, and other components where insulation, roofing, and base flashing is attached to, in place ready to receive insulation and roofing.
2. Complete deck and insulation to provide designed drainage to working roof drains.
3. Document installation of related materials to be concealed prior to installing roofing work.

B. Dry out surfaces, including the flutes of metal deck that become wet from any cause during progress of the work before roofing work is resumed. Apply materials to dry substrates.

C. Sweep decks to broom clean condition. Remove all dust, dirt or debris.

D. Remove projections that might damage materials.

E. Concrete Decks, except Insulating Concrete:

1. Test concrete decks for moisture prior to application of roofing materials. Test for capillary moisture by plastic sheet method according to ASTM D4263.
2. Prime concrete decks, including precast units, with primer as specified. Keep primer back four inches from joints in precast units.
3. Allow primer to dry before application of bitumen.

F. Insulating Concrete Decks:

1. Allow to dry out for at least five days after installation before the placement of materials.
2. If rain occurs during or at end of drying period or during installation of roofing, allow additional drying time before the placement of the roofing materials.

G. Poured Gypsum Decks: Dry out poured gypsum in accordance with manufacturer's printed instructions prior to application of roofing materials.

H. Existing Membrane Roofs and Repair Areas:

1. Comply with requirements in Section 07 01 50.19 PREPARATION FOR RE-ROOFING.
2. At areas to be altered or repaired, remove loose, damaged, or cut sheet that is not firmly adhered only where new penetrations occur or repairs are required.
3. Cut and remove existing roof membrane for new work to be installed. Clean cut edges and install a temporary seal to cut surfaces. Use roof cement and one layer of 7 Kg (15 pound) felt strip cut to extend 150 mm (6 inches) on each side of cut surface. Bed strip in roof cement and cover strip with roof cement to completely embed the felt.

4. At modified bituminous base flashing to be repaired, either bend up cap flashing or temporarily remove cap flashing. Brush and scrape away all deteriorated sheets or surface material of base flashing.

3.3 TEMPORARY PROTECTION

A. Install temporary protection at the end of day's work and when work is halted for an indefinite period or work is stopped when precipitation is imminent. Comply with approved temporary protection plan.

B. Install temporary cap flashing over the top of base flashings where permanent flashings are not in place to provide protection against moisture entering the roof system through or behind the base flashing. Securely anchor in place to prevent blow off and damage by construction activities.

C. Provide for removal of water or drainage of water away from the work.

D. Provide temporary protection over installed roofing by means of duckboard walkways, plywood platforms, or other materials, as approved by COTR, for roof areas that are to remain intact, and that are subject to foot traffic and damage. Provide notches in sleepers to permit free drainage.

3.4 INSTALLATION, GENERAL

A. FM Approvals Installation Standard: Install roofing membrane, base flashings, wood cants, blocking, curbs, and nailers**,** and component materials in compliance with requirements in FMG 4450 and FMG 4470 as part of a membrane roofing system as listed in FM Approval's "RoofNav" for fire/windstorm classification indicated. Comply with recommendations in FM Approvals' Loss Prevention Data Sheet 1-49, including requirements for wood nailers and cants.

B. NRCA Installation Standard: Install roofing system in accordance with applicable NRCA Manual Plates and NRCA recommendations, including ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing".

C. Manufacturer Recommendations: Comply with roofing system manufacturer's written installation recommendations.

D. Coordination with related work: Coordinate roof operations with roof insulation and sheet metal work so that insulation and flashings are installed concurrently to permit continuous roofing operations.

E. Installation Conditions:

1. Apply dry roofing materials. Apply roofing work over dry substrates and materials.
2. Apply materials within temperature range and surface and ambient conditions recommended by manufacturer.
3. Except for temporary protection, do not apply materials during damp or rainy weather, during excessive wind conditions, nor while moisture (dew, snow, ice, fog or frost) is present in any amount in or on the materials to be covered or installed:
   a. Do not apply materials when the temperature is below 4 deg. C (40 deg. F).
   b. Do not apply materials to substrate having temperature of 4 deg. C (40 deg. F) or less.

3.5 INSTALLATION OF MODIFIED BITUMEN MEMBRANE:

A. Primer: Apply primer to substrates where recommended by roofing manufacturer, in application quantities recommended by roofing manufacturer.

B. Cold-Applied Adhesive: Apply cold-applied adhesive in application quantities recommended by roofing manufacturer at substrate, between membrane sheets, and as glaze coat where required.

C. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer's written instructions to ensure a watertight seam installation.

D. Membrane Sheets:

1. Number of Plies: 2, minimum, including base sheet and cap sheet, and additional plies as required to meet load/strain properties specified in Part 1 of this Section.
2. Commence the laying of sheets at the low points.
3. Roll sheets into cold-applied adhesive brushing down to firmly embed, free of wrinkles, fish mouths, blisters, bubbles, voids, air pockets or other defects that prevent complete adhesion:

4. Cut to fit closely around pipes, roof drains, bitumen stops, and similar roof projections.
5. Lap sheets shingle fashion starting with starter strips at right angles to slope of roof.
6. Laps for Top Sheet and Base Sheet:
   a. Base sheet, lapped 75 mm (three inches).
   b. Use 450 mm (18 inch) starting widths, lap top sheet 475 mm (19 inches).
   c. Lap end joints of sheet 150 mm (six inches). Stagger end joints in relation to end joints in adjacent and proceeding plies.

E. Roofing on Nailable Decks:
1. On insulating concrete, install one ply of venting base sheet with mineral aggregate surface down, nailed to deck with lap as specified and seal lap edges with roof cement. Terminate venting base sheet as follows:
   a. At vertical surfaces: Extend venting base sheet up vertical surface over cants to top of base flashing or curb.
   b. At roof edge under gravel stops install venting base sheet over blocking: Extend base sheet not less than two inches beyond outer edge and turn down so that venting can be accomplished.
   c. At roof edge over fascia-cant: Extend base sheet over top of cant and turn down over outer face of cant to permit venting at the edge.

F. Roof edges and terminations:
1. Where nailers occur at roof edges under gravel stops or penetrations to receive metal base flashing, apply a continuous strip of underlayment over the nailers before the first ply sheet is applied. Strip shall be installed on top of venting base sheet if any.
2. After membrane is installed, turn the underlayment back over the roofing, and secure in place with cold-applied adhesive before gravel stops or other metal flanges extending out onto the membrane are installed.
3. Where cants occur at vertical surfaces, cut off roofing sheets two inches above top of cant strips, except at prefabricated curbs, scuttles and other roof accessories having

integral cants, extend membrane over cant and up vertical surface to top of curb or nailer as shown.

4. Where fascia-cant occurs at roof edges, extend membrane beyond outside cant face and cut off at outside after base flashing is installed.
5. Where reglet occurs at vertical surfaces, extend plies roofing sheets up into reglet the full depth of the reglet.

3.6 BASE FLASHING:

A. Provide built-up base flashing over cants and as necessary to make work watertight.

B. Prime vertical surfaces of masonry and concrete with asphalt primer except where vented base sheet is required to provide edge venting.

C. Apply flashing on top of roofing, up face of cant and up the face of the vertical surface, at least 200 mm (eight inches) above the roofing but not more than 350 mm (14 inches) above the roofing, generally full height beneath counter flashing or top of curb flashing.
   1. At fascia-cants, extend to top of cant and cut off at top of cant.
   2. At reglet, extend full depth into the reglet.
   3. Where venting base sheet is used with insulating concrete, do not seal edges of venting base sheet with bitumen; allow for venting.

D. Use two plies of modified bituminous sheet.
   1. Extend the first ply 100 mm (four inches) out on the roofing, and the second ply 75 mm (three inches) beyond the first ply. Lap ends 75 mm (three inches) with joints broken 450 mm (18 inches) in each ply. Use smooth surface modified bituminous sheet for first ply.
   2. Use granular surfaced modified bitumen cap sheet.

E. Set base flashing in a solid application of cold-applied adhesive.
   1. Set cap sheet in cold-applied adhesive with laps sealed with cold-applied adhesive.
   2. Except for venting roof edges, seal the top edge of the base flashing with roof cement.

F. Except at metal fascia cants, secure top edge of base flashing with nails on a line approximately 25 mm (one inch) below top edge, spaced not more than 200 mm (eight inches) on center.

1. Cover nail heads with roof cement.
2. Cover the top of the base flashing with counterflashing as specified in Section 07 60 00, FLASHING AND SHEET METAL. At the fascia cants secure the top edge of the flashing with fascia compression clamp as specified in Section 07 60 00, FLASHING AND SHEET METAL.

3.7 LIQUID-APPLIED FLASHING:

A. Temporary Flashings:

1. Provide a temporary waterproof seal at all membrane edges, penetrations, drains, etc. Unless complete flashings are installed immediately (same working day) following the membrane application.

B. Preparation:

1. Inspect walls, curb heights, counterflashings, etc., and check for conformance with minimum base flashing height of eight (8”).
2. Bring non-conforming areas to the attention of the Owner’s Representative for correction.

C. Primer:

1. Prepare and prime substrate surfaces per manufacturer’s instructions.
   a. Abrade and grind surfaces and clean metal surfaces to bare material when recommended by the manufacturer.
   b. Follow manufacturer’s recommendations for required temperature of substrate and materials, and for filling of voids.
2. Prime all masonry, metal, or concrete surfaces and from the top of the roof membrane to the termination of the flashing level with asphalt primer at the rate of one (1) gallon per 100 square feet or as recommended by the manufacturer.
3. Allow the primer to dry thoroughly.
4. Ensure that bonding surfaces to which the seal or flashing are to be placed are clean and free of moisture, dirt, grease, oil, loose material, and debris.

D. Fluid-Applied Flashing System:

1. Based on PermaFlash System. Follow manufacturer's instructions.
   a. Lay out reinforcement fabric around penetrations and cut to fit. Wrap fabric around penetration and bridge all vertical to horizontal transitions.

3.8 STRIPPING:

A. Coordinate to set flanges of metal flashing in roof cement on top sheet of the modified bituminous roofing and mailing to blocking with Section 07 60 00, FLASHING AND SHEET METAL.

B. Cover that portion of the horizontal flanges of metal base flashings, gravel stops, and other flanges extending out onto the roofing with modified bituminous sheet.

C. Extend the sheet out on the roofing 150 mm six inches beyond the edge of the metal flange. Cut edge to fit tight against vertical members of flange.

D. Prime flange before stripping, embed sheet in cold-applied adhesive.

3.9 ROOF WALKWAYS

A. Install roof walkways where indicated.

B. Set prefabricated planks in solid application of cold-applied adhesive. Maintain 75 mm (three inch) to 150 mm (six-inch) space between planks.

3.10 APPLICATION OF COATING

A. Apply coating on cap sheet when required to meet solar reflectance performance requirements.

B. Apply coating to membrane and base flashings according to manufacturer's written instructions by spray or roller.

C. Provide dry film thickness of minimum 20 mils (0.5 mm).

3.11 FIELD QUALITY CONTROL:

A. Roofing Inspector: Contractor shall engage a qualified roofing inspector for a minimum of 7 full-time days on site to perform roof tests and inspections and to prepare start up, interim, and final reports. Roofing Inspector's quality assurance inspections shall comply with criteria established in ARMA/NRCA's "Quality Control Guidelines for the Application of Built-up Roofing."

B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
   1. Notify Architect and Owner 48 hours in advance of date and time of inspection.
C. Repair or remove and replace components of roofing work where test results or inspections indicate that they do not comply with specified requirements.
   1. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.12 PROTECTING AND CLEANING

A. Protect membrane roofing system from damage and wear during remainder of construction period.
B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements; repair substrates; and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of acceptance by Owner.
C. Clean overspray and spillage from adjacent construction. Clean membrane and restore surface to like-new condition meeting solar reflectance requirements.

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